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AUTHOR Lillibridge, Fred
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ABSTRACT

Two primary data sources were used to create a database of 68 research libraries for this study: (1) Alexander Astin's report for the National Academy of Sciences on the reputational ranks of the top 20 graduate programs at U.S. universities (1985); and (2) a list of 70 "Research Universities I" identified by the Carnegie Foundation for the Advancement of Teaching as top research institutions. The Carnegie list included the NAS top 20; two universities in the Carnegie list, however, could not be included in this analysis because of incomplete information). Seven library-related predictor variables were used to predict the reputational ranks of the universities, i.e., number of volumes in the library; volumes added; current serials total; total microform units; total library expenditures; books per student; and library expenditures per student. Analyses of the resulting data demonstrated that the universities included on the Carnegie list that have also been ranked by NAS in the top 20 have significantly better library resources than institutions with lower reputational ranks. Six tables display lists of Astin's top 20 universities and the Carnegie Foundation's top research institutions together with the results of the statistical analyses. (Contains 11 references.) (KRN)

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Do Leading Research Universities with High Reputational Ranks Have Better Library Resources?

Fred Lillibridge

New Mexico State University

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Do Leading Research Universities with High Reputational Ranks Have Better Library Resources?

The academic library may be the most important resource available to faculty and students in research universities. This paper will show that Carnegie Research I Universities with high reputational ranks have significantly better library resources than do Carnegie Research I institutions that have lower reputational ranks.

Review of Literature

Reputational ratings of the quality of universities and university programs have been of continuing interest. "While academicians often find it difficult to agree on a precise definition of quality, they show considerable agreement when they are asked to name the highest quality institutions" (Astin & Solmon, 1981, p. 14). Alexander Astin ranked the top 20 universities based on a study directed by the National Academy of Sciences [NAS] (Jones, Lindzey, & Coggeshall, 1982) that assessed graduate programs at U.S. universities (Astin, 1985, p. 30). The top 20 universities are shown in Table 1. "Regardless of when the rating are done, virtually the same institutions always show up at the top, and in more or less the same order" (Astin, 1985, p. 27). To illustrate this, when James Cattell published "the first academic quality rankings" for scientific institutions in 1910 (Webster, 1986, p. 116-117),

14 of his top 20 were the same as Astin's top 20. All eight of the "highest-scoring programs in faculty's reputation for scholarly quality" (Webster, 1986, p. 124), were from universities in Astin's top 20. Astin's top 20 were well represented as leading institutions with the top graduate programs in the United States in a national study conducted in 1970 by the American Council on Education (Roose & Andersen, 1970). More recently, U.S. News & World Reports, evaluated national universities on 14 factors and produced a top 25 that listed institutions that were "the biggest of the best" and "offer a wide range of programs, give high priority to research and award many doctoral degrees" (Reeves, 1991, p. 93). Of Astin's top 20, 16 appeared in the U.S. News top 25.

Library expenditures and per student expenditures for library have been used as objective measures of quality higher educational programs (Astin & Solmon, 1981). The number of books in the library and number of books in the library per student are measures of "affluence, which are also generally considered to be indicative of institutional quality" (Astin, 1968, p. 663). The National Academy of Sciences in An Assessment of Research-Doctorate Programs in the United States (Jones, Lindzey, & Coggeshall, 1982), used data from the ALR Statistics, 1979-80 (Mandel & Johnson, 1980), to create a variable to measure university library

size. This variable was used to evaluate the quality of research-doctoral programs.

Method

Population

Two primary data sources were used to create a database of 68 research libraries for this study. The first source was reputational ranks that were reported by Alexander Astin (1985) in Achieving Educational Excellence: A Critical Assessment of Priorities and Practices in Higher Education.

The second source was a list of 70 "Research Universities I" as determined by the Carnegie Foundation for the Advancement of Teaching and published in The Chronicle of Higher Education Almanac in 1989. Table 2 shows seventy (70) Carnegie I institutions were listed in unranked order based on classification criteria established by the Carnegie Foundation. Universities on this list must offer a full range of baccalaureate programs, are committed to graduate education through the doctoral degree and give a high priority to research. Each receives at least $33.5 million in federal support and awards at least 50 Ph.D. degrees annually. The Carnegie classification has been used to group higher education institutions to help ensure that the study population is "closely similar" (Bowen, 1981, p. 23).

Information about each library was found in either ALR Statistics, 1987-88 (Daval & Feather, 1989), or ACRL

University Library Statistics, 1987-88 (Association of College and Research Libraries, 1989). It was not possible to acquire complete data about Rockefeller University or the University of California at San Francisco. While it was possible to find some information about these institution's libraries, it was not possible to find information that was reported in the same format for the same time period as the other 68 colleges. Although Brown University was ranked in the top 20 by the NAS it is not a Carnegie Research I university and therefore was not included in the analysis.

Variables

RANKED. A dichotomous zero/one criterion variable was based on whether or not the university was ranked in the top 20 by NAS.

The following seven continuous library-related predictor variables were used in this study:

Volumes in Library (BOOKS). A physical unit of any printed, typewritten, handwritten, mimeographed, or processed work, contained in one binding which has been cataloged, classified, and made ready for use.

Volumes Added-Gross (NEWBOOKS). Only volumes which have been cataloged, classified, and made ready for use.

Current Serials Total (SERIALS). This includes serials such as periodicals, newspapers, annuals, memoirs,

proceedings, and transactions of societies that have been issued in successive parts.

Total Microform Units in Library (MICROFRM). The number of reels of microfilm, number of microcards, and number of microprint and microfiche sheets held by the library. It does not include government document microforms.

Total Library Expenditures (EXPEND). All expenditures of funds made by the library.

Books per Student (BOOK_STD). The result when Volumes in Library is divided by the total number of full-time students.

Library Expenditures per Student (EXPD_STD). The result when Total Library Expenditures is divided by the total number of full-time students.

Total Full-time Student Enrollment (Fall 1986). This data were used in calculations but is not reported in this paper.

Research Questions

Research Question 1. Do Carnegie Research I universities with reputations that ranked in the top 20 by the National Academy of Sciences have better libraries than those not rated in the top 20 when seven library-related variables are considered?

Full Model: RANKED = Unit Vector + BOOKS + NEWBOOKS + SERIALS + MICROFRM + EXPEND + BOOK_STD + EXPD_STD + Error.

Restricted Model: RANKED = Unit Vector + Error.

Research Question 2. What is the most parsimonious significant model that would result from utilizing the backward elimination technique in SAS Proc Stepwise for seven library-related variables in this study to predict a university's reputational rank?

Full Model: RANKED = Unit Vector + BOOKS + NEWBOOKS + SERIALS + MICROFRM + EXPEND + BOOK_STD + EXPD_STD + Error.

Data Analysis

The data were analyzed using multiple linear regression and Statistical Analysis System (SAS) PROC REG and PROC STEPWISE / Backward). Statistical significance shall be determined with an alpha level of .05, however actual computer generated probability levels will be reported.

Results

Findings suggest that Carnegie Research I universities that also had high reputational ranks by the National Academy of Sciences, had significantly better library resources than other Carnegie Research I institutions.

Research Question 1

Results of statistical analysis shown in Table 3 reveals a significant F VALUE of 11.013 and a R-SQUARE of .5623. Table 4 shows that the means of each of the

predictor variables is higher for the ranked group. Therefore, Research Question 1 is answered in the affirmative.

Research Question 2

Results of the Backward Elimination Procedure is presented in Table 5. The most parsimonious significant model that would result from utilizing the backward elimination technique in SAS Proc Stepwise for seven library-related variables in this study to predict a university's reputational rank is:

Full Model: RANKED = Unit Vector + SERIALS + EXPD_STD + Error.

This model results in a significant F VALUE of 33.47 and a R-SQUARE of .50737. Therefore, Current Total Serials (SERIALS) and Library Expenditures per Student (EXPD_STD) account for just over 50 percent of the variance between ranked and unranked institutions.

Discussion

The purpose of this paper was to demonstrate that colleges included on the Carnegie list of leading research institutions that have been ranked by the National Academy of Sciences in the top 20 have significantly better library resources. This fact has been proven. However, it is not known whether top ranked universities are top ranked because they have large libraries. A complete review of the study

input data shows that it is possible to be a leading research university without having outstanding library resources. However, Table 4 clearly demonstrates that those institutions that are highly ranked have better library resources. It should be noted that the 68 colleges in this study could be considered as the best of the best.

References

Association of College and Research Libraries (1989). ACRL university library statistics, 1987-88. Chicago, IL: Author.

Astin, A. W. (1985). Achieving educational excellence: A critical assessment of priorities and practices in higher education. San Francisco: Jossey-Bass Inc.

Astin, A. W. & Solmon, L. C. (1981). Are reputational rating needed to measure quality? Change, 13(7), pp. 14-19.

Bowen, H. (1981). Cost differences: The amazing disparity among institutions of higher education in educational costs per student. Change, 13(1), pp. 21-27.

Daval, N., & Feather, C. (1989). ARL statistics, 1987-88. Washington, DC: Association of Research Libraries.

Jones, L. V., Lindzey, G. & Coggeshall, P. E. (1982). An assessment of research-doctorate programs in the United States: Social & behavioral sciences. Washington, DC: National Academy Press.

Leading Research Universities. (1989, September 6). The Chronicle of Higher Education: Almanac, p. 24.

Mandel, C. A. & Johnson, M. P. (1980). ALR Statistics, 1979-80. Washington, DC: Association of Research Libraries.

Reeves, S. (1991, September 30). Energizing teaching. U.S. News & World Report, pp. 90-94.

Roose, K. D. & Andersen, C. J. (1970). A rating of graduate programs. Washington, DC: American Council on Education.

Webster, D. S. (1986). Academic quality rankings of American colleges and universities. Springfield, IL: Charles Thomas, Publisher.

Table 1

Astin's Top 20 Universities Based on National Academy of Sciences Finding Reported in An Assessment of Research-Doctorate Programs in the United States

Rank	University
1	MIT
2	Harvard
3	UC Berkeley
4	Stanford
5	California Institute of Technology
6	Yale
7	Chicago
8	Princeton
9	UCLA
10	Michigan
11	Columbia
12	Cornell
13	Wisconsin
14	Illinois
15	Pennsylvania
16	Texas
17	Carnegie-Mellon
18	Washington
19	UC San Diego
20	Brown

Table 2

Research Universities I as determined by the Carnegie Foundation for the Advancement of Teaching

University	University
Arizona	New York
Boston	North Carolina
Case Western Reserve	North Carolina State
Cincinnati	Northwestern
Colorado	Ohio State
Colorado State	Oregon State
Connecticut	Pennsylvania State
Duke	Pittsburgh
Florida	Purdue
Georgia	Rochester
Georgia Inst. of Technology	Rockefeller
Hawaii	Rutgers
Howard	SUNY-Stony Brook
Illinois, Chicago	Tennessee
Indiana	Texas A&M
Iowa	Utah
Johns Hopkins	UC Davis
Kentucky	UC Irvine
LSU	UC San Francisco
Maryland	USC
Miami	Vanderbilt
Michigan State	Virginia
Minnesota	Virginia Polytechnic Inst.
Missouri	Washington U. - St. Louis
New Mexico	Yeshiva
New Mexico State	

Table 3

Computer Output of SAS Proc REG for Dependant Variable

Ranked

DEP VARIABLE: RANKED

ANALYSIS OF VARIANCE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	7	7.699	1.0998	11.013	0.0001
ERROR	60	5.992	0.0998		
C TOTAL	67	13.691			

ROOT MSE	0.3160236	R-SQUARE	0.5623
DEP MEAN	0.2794118	ADJ R-SQ	0.5113
C.V.	113.1032		

PARAMETER ESTIMATES

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T FOR H0: PARAMETER=0	PROB > |T|
INTERCEP	1	-0.191273	0.114923	-1.664	0.1013
BOOKS	1	2.05E-07	1.03E-07	1.991	0.0511
NEWBOOKS	1	-.000002	.000003	-0.760	0.4501
SERIALS	1	0.000013	.000004	2.956	0.0044
MICROFRM	1	-3.76E-08	4.66E-08	-0.806	0.4234
EXPEND	1	-4.18E-08	2.19E-08	-1.911	0.0608
BOOK_STD	1	-0.002419	0.001320	-1.833	0.0717
EXPD_STD	1	0.000859	0.000338	2.539	0.0137

Table 4

Group Means of Carnegie Research I Universities that had High Reputational Ranks Based on National Academy of Sciences Findings and Those that did not have High Reputational Ranks

Group	Variable	N	Mean	SD
High Reputational Ranks				
	Books	19	5,056,013	2,683,199
	New Books	19	132,356	69,633
	Serials	19	55,059	29,653
	Microforms	19	2,933,454	1,501,675
	Expenditures	19	$18,120,431	$8,549,676
	Books/Student	19	338	241
	Expend/Student	19	$1,264	$804
Not Ranked				
	Books	49	2,279,953	880,497
	New Books	49	67,790	26,052
	Serials	49	23,314	10,218
	Microforms	49	2,368,898	991,454
	Expenditures	49	$10,135,430	$3,712,915
	Books/Student	49	145	88
	Expend/Student	49	$638	$357

Table 5

Computer Output of SAS Proc STEPWISE / Backwards for Dependant Variable Ranked - Final Step Results

BACKWARD ELIMINATION PROCEDURE FOR DEPENDENT VARIABLE RANKED

STEP 5 VARIABLE EXPEND REMOVED R SQUARE= 0.507 C(P)= 5.534

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	6.947	3.473	33.47	0.0001
ERROR	65	6.745	0.104		
TOTAL	67	13.691			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-.2820446				
SERIALS	.0000108	.00000179	3.778	36.41	0.0001
EXPD_STD	.0002628	.00006930	1.493	14.39	0.0003

BOUNDS ON CONDITION NUMBER: 1.070459, 4.281836

STATISTICS FOR REMOVAL: STEP 6
DF = 1,65

VARIABLE	PARTIAL R**2	MODEL R**2
SERIALS	0.2760	0.2314
EXPD_STD	0.1090	0.3983

ALL VARIABLES IN THE MODEL ARE SIGNIFICANT AT THE 0.05 LEVEL

SUMMARY OF BACKWARD ELIMINATION PROCEDURE
FOR DEPENDENT VARIABLE RANKED

STEP	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	NEWBOOKS	6	0.004	0.558	6.578	0.5779	0.450
2	MICROFRM	5	0.007	0.551	5.590	1.0193	0.317
3	BOOK_STD	4	0.025	0.526	7.032	3.4645	0.067
4	BOOKS	3	0.004	0.522	5.547	0.4990	0.483
5	EXPEND	2	0.015	0.507	5.534	1.9398	0.169